

WHAT IS CLAIMED IS:

1 1. A lamellar diffraction grating comprising:
2 a substrate; and
3 an arrangement of generally rectangular protrusions spaced along the substrate
4 at an average grating period a , wherein an average height h and an average width w of the
5 protrusions is such that $h/a > 0.5$ and $w/a < 0.5$.

1 2. The lamellar diffraction grating recited in claim 1 wherein the
2 generally rectangular protrusions have substantially equal heights and have substantially
3 equal widths.

1 3. The lamellar diffraction grating recited in claim 1 wherein the grating
2 period corresponds to a line density $1/a$ between 700 and 1100 protrusions/mm.

1 4. The lamellar diffraction grating recited in claim 1 wherein the grating
2 period corresponds to a line density $1/a$ between 800 and 1000 protrusions/mm.

1 5. The lamellar diffraction grating recited in claim 1 wherein h/a is
2 between 0.7 and 1.1 and wherein w/a is between 0.15 and 0.3.

1 6. The lamellar diffraction grating recited in claim 1 wherein h/a is
2 between 0.75 and 1.0 and wherein w/a is between 0.2 and 0.3.

1 7. The lamellar diffraction grating recited in claim 1 wherein h/a is
2 between 0.84 and 0.96 and wherein w/a is between 0.22 and 0.3.

1 8. The lamellar diffraction grating recited in claim 1 wherein the width of
2 each protrusion is defined by a FWHM measurement of a profile of such protrusion.

1 9. A method for diffracting an optical signal, the method comprising:
2 propagating the optical signal towards an arrangement of generally rectangular
3 protrusions spaced along a substrate at an average grating period a , wherein an average
4 height h and an average width w of the protrusions is such that $h/a > 0.5$ and $w/a < 0.5$; and
5 reflecting the optical signal from the arrangement.

1 10. The method recited in claim 9 wherein each of the generally
2 rectangular protrusions has a substantially equal height and width.

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1 11. The method recited in claim 9 wherein the grating period corresponds
2 to a line density $1/a$ between 700 and 1100 protrusions/mm.

1 12. The method recited in claim 9 wherein the grating period corresponds
2 to a line density $1/a$ between 800 and 1000 protrusions/mm.

1 13. The method recited in claim 9 wherein h/a is between 0.7 and 1.1 and
2 wherein w/a is between 0.15 and 0.3.

1 14. The method recited in claim 9 wherein h/a is between 0.75 and 1.0 and
2 wherein w/a is between 0.2 and 0.3.

1 15. The method recited in claim 9 wherein h/a is between 0.84 and 0.96
2 and wherein w/a is between 0.22 and 0.3.

1 16. The method recited in claim 9 wherein the width of each protrusion is
2 defined by a FWHM measurement of a profile of such protrusion.

1 17. A lamellar diffraction grating comprising:
2 substrate means; and
3 means for reflecting an optical signal, such means for reflecting the optical
4 signal including an arrangement of generally rectangular protrusion means spaced along the
5 substrate means at an average grating period a , wherein an average height h and an average
6 width w of the protrusions is such that $h/a > 0.5$ and $w/a < 0.5$.

1 18. The lamellar diffraction grating recited in claim 17 wherein the grating
2 period corresponds to a line density $1/a$ between 800 and 1000 protrusions/mm.

1 19. The lamellar diffraction grating recited in claim 17 wherein h/a is
2 between 0.84 and 0.96 and wherein w/a is between 0.22 and 0.3.

1 20. A method for fabricating a lamellar diffraction grating, the method
2 comprising:

3 forming a pattern for an anisotropic hard etch mask over a surface of a
4 substrate, the pattern having an average grating period a and defining an average protrusion
5 width w for the lamellar diffraction grating such that $w/a < 0.5$; and

6 etching a plurality of gaps into the substrate through the patterned anisotropic
7 hard etch mask to an average depth h such that $h/a > 0.5$.

1 21. The method recited in claim 20 wherein the grating period corresponds
2 to a line density $1/a$ between 800 and 1000 protrusions/mm.

1 22. The method recited in claim 20 wherein h/a is between 0.84 and 0.96
2 and wherein w/a is between 0.22 and 0.34.

1 23. The method recited in claim 20 wherein forming the pattern for the
2 anisotropic hard etch mask comprises:

3 depositing the anisotropic hard etch mask over the substrate;
4 forming a layer of photoresist over the anisotropic hard etch mask;
5 exposing the pattern onto the layer of photoresist;
6 etching the anisotropic hard etch mask through the pattern in the layer of
7 photoresist; and
8 removing the layer of photoresist.

1 24. The method recited in claim 23 wherein etching the anisotropic hard
2 etch mask comprises using isotropic reactive ion etching.

1 25. The method recited in claim 23 wherein removing the layer of
2 photoresist comprises applying an organic solvent.

1 26. The method recited in claim 20 wherein etching the plurality of gaps
2 comprises performing an anisotropic chemical etch.

1 27. A wavelength router for receiving, at an input port, light having a
2 plurality of spectral bands and directing subsets of the spectral bands to respective ones of a
3 plurality of output ports, the wavelength router comprising a free-space optical train disposed
4 between the input port and the output ports providing optical paths for routing the spectral
5 bands, the optical train including a reflective lamellar diffraction grating disposed to intercept
6 light traveling from the input port, wherein the reflective lamellar diffraction grating has an
7 arrangement of generally rectangular protrusions spaced along a substrate at an average
8 grating period a , and an average height h and an average width w of the protrusions is such
9 that $h/a > 0.5$ and $w/a < 0.5$.

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28. The wavelength router recited in claim 27 wherein the grating period corresponds to a line density $1/a$ between 800 and 1000 protrusions/mm.

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29. The wavelength router recited in claim 27 wherein h/a is between 0.84
2 and 0.96 and wherein w/a is between 0.22 and 0.3.

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